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once without waiting for the full plan to go into effect in 1914.

DR. F. P. CHILLENWORTH, Hadam, Conn., has been appointed assistant professor of physiology in the University of Kansas.

At Princeton University the following new instructors and assistants have been appointed: James Waddell Alexander, Ray Edwin Gilman and Edward Staples Smith, instructors in mathematics; John Renshaw Carson, instructor in electrical engineering and physics; Keith Kuenzi Smith, instructor in physics; Percy Noyes Edwards, Charles Irving Place and Charles Hurlbut Sterrett, instructors in geodesy.

DR. HANS STILLE, professor of mineralogy and geology at Hamburg Technological School, has accepted a call to Leipzig, as the successor of Professor H. Credner, who has retired.

DISCUSSION AND CORRESPONDENCE

THE FIRST USE OF TRINIDAD PITCH FOR ROAD MAKING

THE appearance in *The Popular Science Monthly* for July and August, 1912, of Dr. Clifford Richardson's very interesting and informing article entitled "Trinidad and Bermudez Asphalts and their Use in Highway Construction," leads me to think that the publication of the following account of what is probably the earliest American use of pitch for road making may from an historical standpoint not be devoid of interest. It was found in the course of some other research in Vol. I. of R. Montgomery Martin's "History of the West Indies, comprising Jamaica, Honduras, Trinidad, etc.," which is Vol. IV. of "The British Colonial Library" by the same author. This book was published in 1836. For its use I am indebted to the kindness of Mr. Herbert Putnam, Librarian of Congress.

On page 195, at the close of his description of La Brea, the pitch lake, is found the following footnote:

I am indebted to the personal courtesy of Major General Sir Lewis Grant, late Governor of

Trinidad, for the following facts: "The pitch of the lake has been adopted for the improvement of the roads, particularly in the fertile district of Naparima, where it was brought for the purpose from La Brea. In the wet season the roads at Naparima are almost impassable in those parts where there has been no application of the pitch; but where the pitch has been applied, which is the case for several miles in North Naparima, there is a hard surface formed, which makes transport comparatively easy, both from the support afforded and from the little friction of the hardened pitch."

From the above it may be seen that pitch was used locally for road making in Trinidad some time, possibly several years, prior to 1836, the date of Martin's book. The use of pitch in Europe, so far as the present writer has been able to ascertain, but little antedates the above. Eirinus, a Greek physician, made use in 1712 of asphalt from the Val de Travers, Neuchâtel, Switzerland, as a coating for both stone and wooden walls to protect them from decay caused by insects, changes of temperature and weather. He knew of its use in Babylon as an ingredient of mortar, and seems to have used it in the same way as a lining for cisterns and as a coating for walls and floors of warehouses. However, it seems to have been first used as a road material by Count de Sassenay, who obtained his material from the same source as Eirinus and made use of it on the roads of France as early as 1832. This seems to have been rock or block asphalt. Rock asphalt was used in paving the streets of Paris in 1838, but not on a large scale until 1854. The same material was first used on the streets of London in 1869. The first pavements of this material in the United States were laid in Newark, New Jersey, in 1870. The following year saw streets in New York paved with asphalt and shortly thereafter Philadelphia followed suit. These three cities all made use of Trinidad asphalt in the rock (*i. e.*, presumably block) form. However, its use as a paving material on a large scale in the United States began with the rehabilitation of the streets of our national capitol, Washington, in 1876-77. Here both

rock and sheet asphalt were laid, the latter so successfully that its use has become widespread throughout the world.

It is commonly believed that the Incas of Peru made use of asphalt in building roads, but no evidence has ever been found to sustain that belief, and recent travelers have seriously questioned the excellence of those roads.

That asphalt was known to the ancients is a well-attested fact, its use as a binder for masonry in Babylon being in point, but of its use other than this we know nothing. Strabo tells us that as early as 2000 B.C. the streets of Babylon were paved, and so, too, presumably were the great roads leading out from the many gates of that city. Babylon was situated in the alluvial plain of Mesopotamia and its building material was almost entirely clay, either as such or in the form of bricks. It seems rather doubtful that these latter were used to pave the streets at that early date. Asphalt was abundant and much used in building operations, and it does not seem improbable that it was utilized to improve the streets. However, this is conjecture, for none of the reference books at hand contain any record of its use as a road-making material in those far-distant times.

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THE "WILLIAMS' PROCESS" OF PHOTOGRAPHY

TO THE EDITOR OF SCIENCE: It may be of interest to your readers to know that as of July 1, 1912, there has been dedicated to the free use of science and scientists the patented process for photographic illustrations (U. S. Pat. No. 640,060), owned by the undersigned and known among paleontologists, who found it especially useful in specimen work, as the "Williams' Process." In brief, it consists in the deposition by sublimation on the object to be photographed of an extremely tenuous monochrome film for the purpose of obviating the reflection, refraction and distorted shadow values common in ordinary photography of certain classes of objects.

It has been a matter of great regret to the

writer that a long-continued and expensive investigation, arising out of an entirely legitimate difference as to the scope and validity of the patent, has delayed until now the fulfillment of the original intention of the writer to make this dedication so soon as the expenses incurred in perfecting and establishing the patent should have been secured by the moderate royalties hitherto charged. The outcome of the controversy has entirely justified the writer's position: the opinion of the opposing experts conclusively confirming the fundamental character of the invention.

As one interested in science, the writer would have been pleased if his means had permitted the assumption of all the expenses of this patent without thought of recoupment, and is heartily sorry that there are those who felt that the failure to do so is culpable. If it is so, I can only plead that it is so in violation of no code with which I am familiar.

In view of the fact that the invention was originally made by my honored father, Dr. Henry Shaler Williams, of Cornell University, it is most desirable that certain facts be stated for the benefit of those who may in the past have been under a misapprehension as to his relation to the patent. Almost immediately after being granted the patent was transferred from him to me in good faith and in consideration of the assumption of debts incurred in its development. My father's wish always has been that the process should be made freely available to science gratis, and I promised him it should be as soon as its financial situation could be cleared up. It has never yielded a cent of profit to Henry Shaler Williams, nor was it taken over or ever handled with the idea of exploiting science or making commerce of its needs. This can not be stated too strongly. With the long-drawn-out controversy referred to my father has not only had nothing to do, but has repeatedly endeavored to induce me to abandon it.

Therefore the blame in the matter, if blame there be, is entirely mine and I cheerfully shoulder it; but he should be given complete exoneration from any such charge. Those who have been disposed to think critically of